

Abstract

This invention relates to the field of materials of the photorefractive crystal. The composition of these crystals is $\text{Li}_{1-x}\text{Nb}_{1+y}\text{O}_3: \text{Fe}_m, \text{M}_n$, where M can be magnesium, indium, or zinc; when using q to denote the ion valence of M ($q=2$ when M is Mg or Zn, and $q=3$ when M is In), the values of x, y, m, and n are in the range of $0.05 \leq x \leq 0.13$, $0.00 \leq y \leq 0.01$, $5.0 \times 10^{-5} \leq m \leq 7.5 \times 10^{-4}$, and $0.02 \leq qn \leq 0.13$. This invention greatly improves the photorefractive properties of LiNbO_3 crystals: makes it have a high diffraction efficiency (more than 68%), a fast response speed for photorefraction (an order of magnitude faster than iron doped LiNbO_3), and a high resistance to optical scattering (the light intensity threshold to photorefractive fan scattering near two orders of magnitude larger than $\text{LiNbO}_3: \text{Fe}$). This invention is an excellent three-dimensional optical storage material and has a vast potential market.